AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions of claims in the application.

Claim 1 (Withdrawn): An electron beam apparatus, comprising:

an electron gun having a cathode and an anode for emitting an electron beam and for focusing and irradiating the electron beam onto a sample;

a detector for detecting secondary electron beams emanated from the sample; and

an electro-optical column has a condenser lens, and two-stage deflectors disposed between said condenser lens and said electron gun, wherein said two-stage deflectors deflect and direct an electron beam emitted from said cathode in a specific direction so as to be in alignment with an optical axis direction of said electron beam apparatus.

Claim 2 (Withdrawn): An electron beam apparatus according to claim 1, wherein said electron beam emitted in the specific direction being at a certain angle with respect to the optical axis due to the fact that, among crystal orientations of said cathode, a specific crystal orientation allowing a higher level of electron beam emission is out of alignment with the optical axis direction.

Claim 3 (Withdrawn): An electron beam apparatus according to claim 1, wherein one deflector of said two-stage of deflectors, which is disposed closer to said electron gun, is an electromagnetic deflector and the other deflector of said two-stage of deflectors, which is disposed closer to said sample, is an electrostatic deflector.

Claim 4 (Withdrawn): An electron beam apparatus according to claim 1, wherein the crystal of said cathode is composed of carbide, boride or nitride of transition metals.

Claim 5 (Withdrawn): An electron beam apparatus according to claim 1, wherein only an electron beam that has been emitted in a particular direction among a plurality of electron beams emitted in different directions from said electron gun is guided onto said sample, and the electron beams emitted in the directions other than said particular direction are absorbed into said anode.

Claim 6 (Currently Amended): An electron beam apparatus for evaluating a sample surface comprising:

an electron gun having a cathode and anode for emitting an electron beam and for focusing and irradiating the electron beam onto a sample surface;

a detector for detecting secondary electron beams emanated from the sample surface;

wherein the sample surface has a partial region which is providing a relatively weak region against dielectric breakdown being caused by irradiating the electron beam; and

a controller for controlling the electron beam so as ~~to irradiate a specified region~~ not to be irradiating the weak region, wherein the weak region has a gate oxide film of a transistor formed thereon and a electric connection with the region of the gate oxide film.

Claim 7 (Previously Presented): An electron beam apparatus according to claim 6, wherein said electron beam apparatus comprises an electron optical system which

produces a decelerating electric field for a primary electron beam between an objective lens and said sample.

Claim 8 (Currently Amended): An electron beam apparatus according to claim 6, wherein scanning operation of the electron beam is adapted to be applied over an entire surface of the sample, while said electron beam may be blanked when said electron beam is to scan said ~~specified~~ region relatively weak against said dielectric breakdown.

Claim 9 (Currently Amended): An electron beam apparatus according to claim [[1]] 6, wherein said ~~specified~~ secondary electrons emanated from an electron beam irradiated region [[is]] on a surface of the sample are detected so as to evaluate the sample, wherein a surface of a sample is segmented into a region relatively weak ~~region~~ against dielectric breakdown ~~being caused by~~ and the other regions, wherein small dose levels of the ~~irradiating~~ electron beam is applied to said respective weak regions so as to evaluate the surface of the sample.

Claim 10 (Withdrawn): An electron beam apparatus comprising:

an electron gun having a cathode and an anode for emitting an electron beam and for focusing and irradiating the electron beam onto a sample; and

a detector for detecting secondary electron beams emanated from the sample,

wherein said electron beam emitted from said electron gun having a hot cathode is irradiated against an aperture and the electron beam after having passed through said aperture is reduced and projected onto said sample, two-stage of deflectors is operated to scan said sample, and said secondary electron beams emanated from the sample are

accelerated by an electric field produced by an objective lens and guided by an E x B separator into said detector, wherein said two-stage deflectors set a pivot point of deflection in such a location that minimizes a transverse chromatic aberration in the proximity of said objective lens.

Claim 11 (Withdrawn): An electron beam apparatus as claimed in claim 10, wherein said electron gun is operating under a space charge limited condition.

Claim 12 (Original): An electron beam apparatus as claimed in claim 10, wherein said aperture is square shaped.

Claim 13 (Withdrawn): An electron beam apparatus as claimed in claim 10, wherein a negative voltage is applied to said sample and a voltage having a lower potential than that of said sample is applied to a lower electrode of said objective lens.

Claim 14 (Withdrawn): An electron beam apparatus for evaluating a sample surface comprising:

an electron gun having a cathode and anode for emitting a primary electron beam and for focusing and irradiating the primary electron beam onto the sample surface;

a detector for detecting secondary electron beams emanated from the sample surface;

an electron optical system having an objective lens for decelerating and scanning the primary electron beam onto the sample wherein the primary electron beam focused by the objective lens; and

a deflector for deflecting a secondary electron beam emanated from the sample from the electronic optical system to the detector, wherein the electronic optical system evaluating a flat wafer within a range defined in as an inner side from the periphery of the wafer by a distance greater than "R" mm, wherein said objective lens designed in a relationship as represented by an expression:

$W+D/2 \leq R$ mm

where "W" is a working distance of said objective lens, and "D" is a bore diameter of an electrode of said objective lens disposed in a location closest to said sample.

Claim 15 (Withdrawn): An electron beam apparatus as claimed in claim 14, wherein R is 5.

Claim 16 (Withdrawn): An electron beam apparatus as claimed in claim 14, wherein at least said objective lens has an electrode of axisymmetric structure made of an insulating material with a metal coating applied selectively onto a surface thereof.

Claim 17 (Withdrawn): An electron beam apparatus as claimed in claim 16, wherein a plurality of electron optical system, having the features in of claims 14 to 16 is arranged in parallel above a sheet of sample, is arranged in parallel above a sheet of sample.

Claim 18 (Withdrawn): An electron beam apparatus for evaluating a sample surface comprising:

an electron gun having a cathode and an anode for emitting an electron beam and for focusing and irradiating the primary electron beam onto the sample surface; and

a detector for detecting secondary electron beams emanated from the sample surface,

wherein said electron beam apparatus has an electron optical column configured such that an electron beam emitted from a thermionic emission cathode may be irradiated against said sample and either one of secondary electrons, back scattered electrons or absorbed electrons, which has been emanated from said sample, is detected in a detecting system, and

cathode is a thermionic emission cathode and is determining a value for a heating electric power of said thermionic emission cathode by evaluating a signal/noise ratio or a noise level detected in said detecting system during a period when said electron beam is irradiated against said sample while changing the heating electric power of said thermionic emission cathode.

Claim 19 (Original): An electron beam apparatus as claimed in claim 18, wherein the value for the heating electric power of said thermionic emission cathode is determined in such a manner that said signal/noise ratio exceeds a predetermined value or said noise level is not greater than a predetermined value when a certain level of beam current is applied to the sample from the electron beam emitted from said thermionic emission cathode.

Claim 20 (Original): An electron beam apparatus as claimed in claim 18, wherein the value for the heating electric power of said thermionic emission cathode is determined

in such a manner that an increasing rate of said signal/noise ratio with respect to the heating electric power is not greater than a predetermined value or a decreasing rate of said noise level is not greater than a predetermined value when a certain level of beam current is applied to the sample from the electron beam emitted from said thermionic emission cathode.

Claim 21 (Original): An electron beam apparatus as claimed in claim 18, wherein the value for the heating electric power of said thermionic emission cathode is determined by evaluating a noise current/beam current ratio.

Claim 22 (Original): An electron beam apparatus as claimed in claim 18, wherein the value for the heating electric power of said thermionic emission cathode is tentatively determined in such a manner that a variation in an electron gun current observed during the period when the heating electric power of said thermionic emission cathode being changed is moderate, and following the tentative determination, the value for the heating electric power of said thermionic emission cathode is ultimately determined based on an evaluation of the signal/noise ratio or the noise level detected in said detecting system.

Claim 23 (Original): An electron beam apparatus as claimed in claim 18, wherein the value for the heating electric power of said thermionic emission cathode is determined in consideration of a relationship between the heating electric power of said thermionic emission cathode and said signal/noise ratio and another relationship between the heating electric power of said thermionic emission cathode and a lifetime of said thermionic emission cathode.

Claim 24: (Previously Presented): A device manufacturing method, comprising:

preparing wafers;

processing the wafer;

evaluating said processed wafers using electron beam apparatus as claimed in claim 6;

repeating said last two steps; and

assembling devices using said processed wafers.

Claim 25: (Withdrawn): An electron beam apparatus as claimed in claim 15, wherein a plurality of electron optical systems, wherein at least said objective lens has an electrode of axisymmetric structure made of an insulating material with a metal coating applied selectively onto a surface thereof, is arranged in parallel above a sheet of sample.

Claim 26: (Withdrawn): An electron beam apparatus as claimed in claim 16, wherein a plurality of electron optical systems, wherein at least said objective lens has an electrode of axisymmetric structure made of an insulating material with a metal coating applied selectively onto a surface thereof, is arranged in parallel above a sheet of sample.

Claim 27 (Currently Amended): An electron beam apparatus for evaluating a sample surface comprising:

an electron gun having a cathode and anode for emitting an electron beam and for focusing and irradiating the electron beam onto a sample surface;

a detector for detecting secondary electron beam emanated from the sample surface; and

a controller for controlling the electron beam with a small dose level of the electron beam for a ~~specified~~ relatively weak region against dielectric breakdown being caused by irradiating the electron beam.

Claim 28 (Currently Amended): An electron beam apparatus according to claim 27, wherein said ~~specified~~ relatively weak region is a ~~weak~~ region having a gate oxide film of a transistor formed thereon and an electric connection of the gate oxide film.

Claim 29 (Previously Presented): A sample evaluation method comprising:

emitting an electron beam from an electron bun having a cathode and anode;

focusing and irradiating the electron beam onto a sample surface;

detecting secondary electron beam emanated from the sample surface;

specifying a partial region on said sample surface which is a relatively weak region against dielectric breakdown being caused by irradiating the electron beam, and

controlling the electron beam so as not to be irradiated onto said weak region.

Claim 30 (Previously Presented): A sample evaluation method comprising:

segmenting said sample into a region relatively weak against dielectric breakdown and the other region;

emitting an electron beam from an electron bun having a cathode and anode;

focusing and irradiating the electron beam onto a sample surface;

detecting secondary electron beam emanated from the sample surface and;

controlling said irradiation of the electron beam so that a small dose level of the electron beam is applied to said respective weak region so as to evaluate the surface of the sample.